The "Perfect Wall System" for Exterior Cavity-Wall Building Enclosures

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Course Description

This program considers the advantages of installing the thermal envelopes of buildings on the exterior side of the backup wall in brick and panel-clad cavity walls using spray-applied polyurethane foam (SPF) and A/V barrier transition membranes. While this method of constructing high-performance envelopes is a long-established design in Canada, this so-called "Perfect Wall System" is becoming the system of choice for high-performance energy-efficient multi-family and commercial building enclosures here in the US.

The presentation begins with a survey of current exterior insulation and air and vapor barrier systems, including spray-applied polyurethane foam. An introduction to the polyurethane foam technology is then given, including processing, application methods, and the physical properties of medium-density, spray-applied closed-cell foam.

This is followed by a review of the thermal envelope functions provided by each system component. Basic principles of building science related to these functions are examined, including health, safety, and welfare issues, in a discussion of how exterior applications can provide reliable, high-performance thermal envelopes when compared to interior applications.

Air and vapor barrier system options and materials are discussed with respect to their multi-purpose functionality and when they should be used to supplement spray-applied polyurethane systems. Drainage plane and flashing implications are reviewed.

It then covers the specifics of how to detail and specify the assembly to maximize insulation and air barrier performance at the lowest possible cost. Material and product selection considerations include compatibility, buildability, durability, and performance. Detailing considerations include wall component placement, design intent communication, sequencing, and air barrier continuity. Typical details for conditions from below grade up to the parapet are presented. Successful and problematic details are used to illustrate design strategies. Building Code issues are also reviewed.

Finally, this course demonstrates the construction process using several case studies, and then illustrate the post-contract commissioning process. The steps include an air barrier kick-off meeting, product and installation quality assurance protocols, the air barrier compliance test, and post-occupancy energy use tracking. How buildings using this approach in combination with an integrated design process can actually have a significantly lower up-front cost, while providing superior energy performance, is demonstrated with project cost and performance data.

Case studies are used to demonstrate various field applications and to illustrate technical responses to questions frequently asked about this system (interactive). A PowerPoint slide presentation is the basic format of this program. Mockups and samples of hardware and materials options are included.

Learning Objectives:

1. Participants will be able to identify the building science and environmental issues related to this and alternative wall assemblies.
2. Participants will be able to design high-performance commercial building enclosures for future projects.
3. Participants will be able to properly detail and specify exterior spray-applied polyurethane foam (SPF) and A/V barrier transition membranes for their projects.
4. Participants will be able to evaluate the air barrier performance of the material components and predict whole-building air leakage rates of the constructed building.
5. Participants will be able to calculate the airtightness performance of their design using the Perfect Wall System approach.
6. Participants will be able to use the Perfect Wall System to achieve a guaranteed air leakage rate for their projects.
7. Participants will be able to avoid typical causes of cost over-runs in their designs using this approach.
8. Participants will be able to specify the advanced quality assurance and test protocols that are required to achieve airtightness performance goals in their future commercial projects.
9. Participants will be able to identify the relationship between high-performance goals and budget limitations.
10. Participants will be able to calculate and compare the total cost of materials and systems using an integrated design process.
11. Participants will be able to specify and employ state-of-the-art product and air barrier quality assurance protocols for their projects.
12. Participants will be able to utilize the most appropriate material technology and application methods related to exterior applications.
13. Participants will be able to relate their projects to similar applications in real-world case studies demonstrating application methods, performance, and cost.
14. Participants will be able to justify the use of high-end air barrier and insulation materials in the context of whole-building construction costs.
15. Participants will be able to report and track the performance and cost of their completed projects.
16. Participants will be able to rank this enclosure design strategy against other design approaches by tracking the energy use of their completed projects.

Options for structuring this program are as follows:

- As a stand-alone one-hour or 90-minute session that provides an overview of the approach.
- As a stand-alone four-hour in-depth workshop taught with a brief introduction and specific how-to instruction.
- As a two-part program including the overview session early in the conference that would introduce the topic, and the workshop later in the conference as a continuation of the program. Additional Learning Objectives can be provided for the longer program, if required.
